BIOC 112: Introductory Biological Research Challenges

SYLLABUS Spring 2019

Class Meetings

Tuesday, 1-4 pm, Anderson Biological Laboratories (ABL) 126

SPECIAL NOTE: As you will be working with a model organism and since living organisms can be unpredictable, there may be other times throughout the semester where you will need to come in on additional days/alternative times.

INSTRUCTOR

Dr. Beth Beason-Abmayr (**bbeason@rice.edu (mailto:bbeason@rice.edu)**): HBH 08A (office) / ABL 126 (lab); office hours are by email appointment in ABL 126

This semester I will be conducting a study looking at teaching and learning. The purpose of this study is to determine the factors that influence teaching effectiveness and learning. *Your participation in this study will last for the duration of the current semester and will entail activities no different from the regular activities you would otherwise engage in as part of the course.* If you would like more information, please do not hesitate to ask. If you would like to opt out of the study, please talk to Dr. Beason as soon as possible.

COURSE OBJECTIVES AND LEARNING OUTCOMES

BIOC 112 explores science with a more open approach and involves guided participation in scientific research in collaboration with a research laboratory in BioSciences. **In this discovery-based course, teams of students work on investigative, client-based projects with opportunities to design experiments, analyze data, and communicate their findings.** The project may vary from semester to semester. ***Overall learning goals and intended learning outcomes for the course are outlined below.*** As you look over the BIOC 112 goals and specific objectives below, please consider which areas represent your strengths, in which areas you want to strengthen your skills, and in which areas you have little or no experience. Return to this list later in the class to assess for yourself whether you are progressing towards these goals.

Goal 1: Possess basic laboratory skills desired of an independent researcher

Understanding the rationale behind procedures and asking questions that reflect a willingness to learn promote effective time management and successful completion of experiments. Our best students are always the ones who are engaged in the learning process. An independent researcher

- follows standard protocols to complete specific procedures
- performs logical troubleshooting of laboratory procedures
- adheres to instructions on laboratory safety, and recognizes hazardous situations and acts appropriately
- uses and stores equipment properly
- handles lab reagents and solutions sensibly
- performs basic lab calculations to prepare solutions and samples for experiments
- measures and reports uncertain quantities with appropriate precision
- applies appropriate methods of analysis to raw data
- converts raw data to a physically meaningful form with appropriate units

Goal 2: Understand the importance of effective communication and of detailed and accurate record keeping

Communication and record keeping are fundamental to the dissemination of science. A student who is an effective communicator

- maintains a timely, comprehensive laboratory notebook with sufficient detail to repeat experiments, troubleshoot procedures, and analyze data
- shares information orally
- writes effectively in appropriate style and depth
- makes effective use of information resources

Goal 3: Recognize the importance of maturity and responsibility when working in a professional environment

In addition to working independently, each student is expected to work well with each member of a team. A mature and responsible student

- employs all available resources to prepare for laboratory work
- takes the initiative to note when assignments are due and completes them on time
- follows instructions for completion of assignments and execution of lab procedures
- works independently but seeks help when appropriate
- works effectively as part of a team and divides lab responsibilities to complete work in a timely manner
- admits when mistakes or errors are made and accepts responsibility for actions
- learns from mistakes as well as successes and is open to suggestions from teammates, TAs, or the instructor
- recalls routine procedures without having to consult a teammate, TA, or instructor

- takes the initiative to refresh past understanding of methods, procedures, explanations, and theory
- shares specific observations and experiences with teammates
- when necessary, picks up responsibilities if partner is unable to carry them out

Goal 4: Experience that not all scientific experiments work as planned

Many scientific experiments do not work as planned and often yield either no results or findings that conflict with or differ from previous experiments. Our teaching labs in BioSciences provide a "safe" and nurturing environment where a student can

- respond to questions that require troubleshooting of experimental methods or data collection
- use laboratory notes and observations to evaluate the success of experiments and identify potential errors when outcomes are unanticipated
- make corrections or alterations after missteps in experimental procedures, adjusting their schedule or research plan appropriately
- observe how other students report errors in posters or presentations

Required Text and Resources

- Victoria E. McMillan, *Writing Papers in the Biological Sciences*, Fifth Edition (2012) or Sixth Edition (2017), Bedford/St. Martin's
- Scientific research articles (links/PDFs provided in Canvas Files)
- **Canvas**: modules, course videos, supplemental resources, pre-lab exercises, assignments, announcements, grade postings, and more

Preparation

Each week while the course meets formally you are expected to prepare for each laboratory session. For the detailed schedule and background/details for each lab, see Canvas Modules. Homework, quizzes, reflections, and writing assignments are submitted when specified in Canvas; students will get feedback and grades on these assignments within a week.

For laboratory work:

- Read the rules for safe conduct in the laboratory (see **Rice BioS_Lab safety and conduct.pdf**) before the first lab session and be aware of special safety concerns for each lab meeting
- Read over the Modules and review the appropriate materials/resources in Canvas and/or on external web sites or in scientific research papers and identify any questions for the instructor
- Prepare an outline (procedure, notes, calculations) so that you are ready to perform labwork
- Complete and submit online pre-laboratory assignments before coming to lab sessions
- Record your prelaboratory calculations in your notebook when applicable
- *Take notes in your team lab notebook*: the lab notebook will remain in the lab at all times throughout the

semester; at the end of each lab, designate a team member to take photos of the pages and upload them to your team page in Canvas.

Follow-up work:

- Monitor assignment due dates each week to ensure that you are aware of upcoming assignments
- Check e-mail and Canvas Announcements frequently for new or updated class information

NOTE: You are responsible for printing procedure information and additional resources for each day of lab (i.e., there are no handouts). Please see the course web site and Canvas for further details. Please bring your personal computer to discussion and lab with you.

ATTENDANCE POLICIES

Attendance at all class and laboratory meetings is required. Absences may be excused due to illness or unexpected/unavoidable emergencies; students are expected to contact the instructor as soon as possible in the event of an emergency. Make-up lab sessions are unable to be offered.

ASSESSMENT AND GRADING

All work is to be completed <u>individually</u> unless otherwise specified. You must submit paper and/or electronic copies of homework and the research paper drafts/final version by the specified time on the due date. **For full credit, all assignments must be submitted on time. The penalty for late assignments is 10% of the total score per 24-hour period past the deadline.** Due dates for assignments are listed in Canvas; these dates are subject to change. Do not ask for an individual extension to a due date because you have a paper due, or three exams, or your computer crashed; due dates are set so that you have plenty of time to complete your work. Don't wait until the night before to start - there is no penalty for starting early. ***It is your responsibility to plan ahead.***

Although in the real world there are often no excuses, you will be given a break on assignments due to circumstances that are truly beyond your control. *Alternative due dates will be worked out with the instructor <u>on an individual basis.</u>* Here are examples of **permissible reasons for a late submission**:

- A *serious* illness (flu is serious - upset stomach or case of the sniffles is not) or accident
- A *serious* family emergency or death (you are on your honor here)
- Other unusual circumstances may count also. For example, if the university closes due to flooding on the date the work is due.

Pre-lab exercises, Reflections, and Surveys are submitted in Canvas in "Quizzes": although there is no time limit for completing these, you are allowed a single submission. Please check Canvas for the Release/Due Dates; you must submit your work during this time frame to get full credit. *You must complete all of the pre-lab exercises ALONE* (i.e., do not work on the pre-lab with anyone else); you may use your class notes/web

sites/Scopes, etc.; have a calculator and pen/pencil with scratch paper on hand as you answer the questions.

Contributions of assignments to the final course grade are as follows:

Assignment	**Weight (%)**
Research Communication: experimental plan, research progress report, research presentation	40
Laboratory Notebook (Team)	20
Laboratory Citizenship	20
Engagement & Participation: Homework, Quizzes	15
Reflections and Surveys	5

The final weighting for each category is subject to change at the discretion of the instructor; after all assignments have been graded, the instructor may change the weighting to raise final course grades.

Communication Instruction

Both written and oral communication are emphasized in this course. As a team, you will maintain a **laboratory notebook** to academic standards (see description below and in Assignments); your notebook will be graded each week during the semester. Ongoing verbal communication with your teammates during lab is essential for promoting a strong team dynamic and critical for completing the procedures in lab and analyzing the data.

We intend to use the overall quality of the laboratory notebook and your specific notebook entries to evaluate your effort. Describe all procedures that you perform in sufficient detail to repeat the experiment and record any raw data. Remember to describe any problems encountered or unexpected results.
See **Laboratory Notebook Guidelines.pdf**, **Notebook Tips.pdf**, and **Notebook_outline.pdf**; also see the Lab Notebook Module. *Each team will maintain a single laboratory notebook - notebooks will be given to you on the first day of lab*:

- ***Each team member is expected to make daily entries in the notebook during each lab; put your initials at the end of each entry you make.*** *A single team member must not, for example, act as a*

recordkeeper by writing in the notebook while the others carry out the work. You may want to take turns writing the *Objectives/Daily Summary* for each lab day. Take turns recording information during lab and initial at the end of each entry by a different member of the team. At the end of the session, remember to draw a line through any remaining blank spaces.

- When you finish for the day, record the time on the final page and draw a line through any remaining blank spaces.
- *It is absolutely critical that you record details such as WHO did WHAT (e.g., loading samples on the gel, setting up PCR, etc.) and LABELS on your samples.* You must have this information in your notebook to determine where a procedural error(s) occurred and to use the correct sample for that day's procedures.
- Remember, **do NOT "pre-write" objectives or methods in your notebook BEFORE you come to lab.**
- *You must have a TA initial/date the LAST notebook page for each lab session BEFORE leaving lab EACH day.*

As an individual, you will write a **Research Progress Report**; you will submit a draft of of the report and will have the opportunity to revise your work based on feedback from the instructor. On the last day of class, you will give a **team presentation**; you will submit drafts of your slides and also meet with a consultant in the writing center.

You are encouraged to make appointments with the peer consultants at the Center for Academic and Professional Communication (CAPC) for your communication assignments in this course. These consultants do not proofread or edit your work, but they will provide feedback on topics such as the organization of your paper, the coherence of your argument, and appropriate sentence structure. NOTE: For this course you are NOT allowed to work with a consultant who is a biosciences major or to get any assistance with the content of the assignments. You can make an appointment at the Center's website: **https://cwovc.rice.edu/home (https://cwovc.rice.edu/home)** . Please consult with Dr. Beason if you have any questions.

Evaluation of Performance

We expect students to follow explicit instructions and to recall and apply previous training to each new project. Puncutality, safe conduct in the laboratory, and efficient completion of responsibilities will enter into the evaluation of overall performance. Read about our expectations and performance criteria in **lab citizenship_2017.pdf**.

HONOR CODE POLICY

All students will be held to the standards of the Rice Honor Code, a code that you pledged to honor when you matriculated at this institution. Consult the Honor System Handbook at **http://honor.rice.edu/honor-system-handbook/ (http://honor.rice.edu/honor-system-handbook/)** for details about this code and how it is administered. This handbook outlines the University's expectations for the integrity of your academic work, the procedures for resolving alleged violations of those expectations, and the rights and responsibilities of

students and faculty members throughout the process.

When you turn anything in you must be able to make the statement, "On my honor, I have neither given nor received any unauthorized aid on this assignment." Assignments to which this pledge apply are notebook entries, homework, quizzes, reflections, and writing assignments. The nature of these assignments may necessitate additional explanation. Specific honor code details for written assignments are included with the assignment; however, the following applies to all written assignments. No one is to have access to any other student's paper or homework for any of the studies in this course, from this semester or from any previous semester. When assignments are written in teams, no team is allowed access to another person's or another team's written assignment as described above. Thus, it is both a violation to provide or post material not provided by the instructor or to use similar material for your own benefit. If you find that previous papers are posted on the web, kept in college libraries, or available in any other form, please report the suspected violation to the honor council.

Rule #1 Unless otherwise noted in writing on the assignment instructions or otherwise directed by an instructor or TA, ALL notebook entries and assignments are to be completed entirely on your own. There is to be no sharing of written work, figures, or notebook pages, nor is there to be any unauthorized collaboration of any kind on these assignments.

Notebooks You are to take notes (1) in lab, (2) as you work, and (3) in your own words. You may paraphrase from a protocol that we give you or that you print from the course web site, but you must not enter the information word for word. Document exactly what you did, even if you made a mistake.

You absolutely must not copy from another student's notebook, even if you share the work with teammates. Communicate with your co-investigators and share the information by word of mouth, and/or confirm what steps your teammates carried out so that you may enter the information in your own words.

Altering a notebook page on a later date in lab is a violation, unless you notify an instructor or teaching assistant in advance and have the alteration initialed.

Homework assignments All homework assignments are to be done entirely on your own. In fact, we recommend that you refrain from completing the homework in the presence of any other student currently in BIOC 112 or who has previously taken the course. Under no circumstances may you "share" the work. Sharing includes any discussion of how to complete any part of any homework assignment. If you have trouble with an assignment then contact an instructor or teaching assistant. If you have waited until the last minute to complete an assignment and do not have time to obtain help, then do the best that you can, and start earlier next time.

Writing assignments The rules for homework assignments apply to writing assignments as well. All specific information that you use for your experimental methods section MUST come from your notebook, NOT from the original protocol. You may consult any of our web resources on writing, including guidelines, presentations, and examples at any time during preparation for the assignment and during the writing itself. You are always welcome to consult with an instructor or teaching assistant but you must not work with other students in the course.

STUDENTS WITH DISABILITIES

Course material will be delivered either digitally (online or email) or in person and may be visual (written documents, slides, videos, etc.), audio (videos, presentations, discussions), or interactive (questions, discussions, clickers, etc.). Course work will require answering questions online, safely performing laboratory procedures, writing in lab notebooks, typing papers, reading written materials, discussing material with peers, and may include light lifting and sitting for extended periods of time. Some interactive portions of lectures will not be available online; thus, students should choose or request seating where they are best able to view and hear presented materials.Any student with a documented or suspected disability needing academic adjustments or accommodations is requested to *contact the instructor in person or by email before the first day of class*; all discussions will remain confidential. **Students with disabilities should also contact Alan Russell (alan.g.russell@rice.edu (mailto:alan.g.russell@rice.edu)), Director, Disability Support Services (713-348-5841) before the first day of class.**

Information contained in this course syllabus, other than the absence policies, may be subject to change with reasonable advance notice, as deemed appropriate by the instructor.